

ABSTRACT

There are provided a carbon fiber precursor fiber bundle which permits easy bundling of a plurality of small tows into one bundle, is provided with a dividing capability to divide into the original small tows spontaneously at the time of firing, and is suitable for obtaining a carbon fiber that is excellent in productivity and quality, and a production method and a production apparatus of the carbon fiber precursor fiber bundle, and an excellent carbon fiber and a production method thereof. A carbon fiber precursor fiber bundle that has a degree of intermingle of 1 m^{-1} or less between small tows, consists of substantially straight fibers without imparted crimp, a tow of which straight fibers has a moisture content of less than 10% by mass when housed in a container, and has a widthwise dividing capability to maintain a form of a single aggregate of tows when housed in a container, taken out from the container and guided into a firing step, and to divide into a plurality of small tows in the firing step by the tension generated in the firing step. A production method thereof. A production apparatus of a carbon fiber precursor fiber bundle, comprising an intermingling device that comprises a yarn channel having a flat rectangular section through which a plurality of small tows can pass in a manner adjacent to each other and a plurality of air jet holes disposed with predetermined intervals along the long side direction of the flat rectangle and having the openings thereof in the yarn channel. A carbon fiber using the precursor fiber bundle and a production method thereof. -